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REMARKS

The Applicants request reconsideration of the final rejection mailed October 21, 2005.

Claims 1-16 and 18-25 are now pending.

In the final rejection, Claims 1-5, 9, 15, 18, and 24 were rejected under 35 U.S.C. 102(b) as being anticipated by Clifton et al., U.S. 4,310,883 (Clifton). Claims 6-7, 10-14, 16, 22, and 25 were rejected under 35 U.S.C. 103(a) as being unpatentable over Clifton in view of Prahlad et al., U.S. 2004/0250033 (Prahlad). Claims 8, 19, and 20 were rejected under 35 U.S.C. 103(a) as being unpatentable over Clifton in view of Kusters et al., U.S. 6,681,310 (Kusters). Claim 23 was rejected under 35 U.S.C. 103(a) as being unpatentable over Clifton in view of Kusters and Prahlad.

The Applicants respectfully traverse each of these rejections at least on the grounds that Clifton does not sufficiently disclose features of the invention, even if combined with one or more of Prahlad and Kusters, such that the claimed invention would be rendered unpatentable.

For example, Clifton is seen to disclose staging and destaging features that do not correspond to the fibre channel transfer required for each of the amended claims. In addition, whereas Clifton has a focus on speed and total

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capacity of a tape library, as a low-performance backup storage Clifton does not employ a virtual volume in any respect, or subtract a virtual volume from a total effective capacity, as required by the amended claims. Moreover, whereas both the tape library and direct access storage devices (DASDs) of Clifton are known to the host computer, the virtual volume is transparent to the host computer in the present invention. That is, the host computer does not know that it is accessing a volume in the claimed one or more second-level storage devices, but rather accesses a virtual volume with the "knowledge" that the virtual volume is part of the first-level storage device or devices.

Thus, Clifton does not teach or fairly suggest a computer system having one or more first-level storage units each containing one or more first volumes, each of the first volumes being a target volume of an access sent from the computer via a fibre channel interface, and the one or more first volumes having at least one virtual volume; a plurality of second-level storage units, each of which is connected through a fibre channel network to and hierarchically linked to, one of the first-level storage units, the second-level storage units containing one or more second volumes, wherein each of the second volumes can be a target volume of an access

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sent from the computer via a fibre channel interface; wherein the one or more first-level storage units are arranged to receive data access requests from the computer to the virtual volume, and to relay the data access requests to at least one of the second volumes based on a relationship between the virtual volume and the at least one second volume that corresponds to the virtual volume, such that the virtual volume as accessed by the computer is transparent as to its relationship to the at least one second volume; and effective capacity calculating means for calculating the total effective capacity of the volumes of the first-level and second-level storage units based on subtracting the capacity of the virtual volume from the total capacity of the first and second volumes by using volume information and virtualization information collected by volume information collecting means and virtualization information collecting means, respectively.

The above discussion pertains directly to the language of amended Claim 1. However, the Applicants note that independent Claim 9 recites a management computer including volume information collecting means for collecting volume information on the total capacity of first volumes from one or more first-level storage units containing the first volumes, wherein each of the first volumes is a target volume of an

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access sent from a computer via a fibre channel interface, and the one or more first volumes having at least one virtual volume. The volume information collecting means also collects volume information on the total capacity of second volumes from one or more second-level storage units, each of which is connected through a fibre channel network to, and hierarchically linked to, one of the first-level storage units, the one or more second-level storage units containing at least one second volume, wherein each of the second volumes can be a target volume of an access sent from the computer via a fibre channel interface. Claim 9 also requires that the at least one virtual volume as accessed by the computer be transparent as to its relationship to the at least one second volume, and that effective capacity calculating means calculate the total effective capacity of the volumes of the first-level and second-level storage units based on subtracting the capacity of the virtual volume from the total capacity of the first and second volumes by using the volume information and virtualization information on the relationships between the virtual volume and the at least one second volume.

Independent Claim 15 is directed to a management method for managing capacities of volumes storing data used by a

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computer, the management method using a management computer and comprising steps of providing one or more first volumes in a first storage unit, each of the first volumes being a target volume of an access sent from the computer via a fibre channel interface, the one or more first volumes having at least one virtual volume; establishing a hierarchical relationship between the first storage unit and a second storage unit that allows one or more second volumes in the second storage unit to be a target volume of an access sent from the computer via a fibre channel interface, wherein the second storage unit is connected through a fibre channel network to, and hierarchically linked to, the first storage unit; and calculating the total effective capacity of the volumes of the first and second storage units based on subtracting the capacity of the virtual volume from the total capacity of the first and second volumes by using volume information and virtualization information collected according to the method.

Independent Claim 18 is directed to a storage medium on which is stored a program designed to run on a management computer, the program causing the management computer to perform a method comprising steps of collecting from a first storage unit, volume information on the total capacity of first volumes contained therein, collecting from a second

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storage unit; volume information on the total capacity of second volumes contained therein; wherein the second storage unit is connected through a fibre channel network to, and hierarchically linked to, the first storage unit, and wherein the hierarchical relationship allows one or more second volumes in the second storage unit to be a target volume of an access sent from the computer via a fibre channel interface; and calculating the total effective capacity of the volumes of the first and second storage units based on subtracting the capacity of the virtual volume from the total capacity of the first and second volumes by using volume information and virtualization information collected according to the method, wherein the first storage unit is arranged to receive data access requests from the computer to the virtual volume, and to relay the data access requests to at least one of the second volumes based on a relationship between the virtual volume and the at least one second volume that corresponds to the virtual volume, such that the virtual volume as accessed by the computer is transparent as to its relationship to the at least one second volume.

Independent Claim 23 is directed to a computer system including one or more first-level storage units each containing one or more first volumes, a plurality of second-

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level storage units each of which is connected through a fibre channel network to, and hierarchically linked to, one of the first-level storage units, the second-level storage units containing one or more second volumes, and a management computer for managing the status of the volumes contained in the first-level and second-level storage units. More particularly, Claim 23 is directed to a management method for managing the volumes in the first-level and second-level storage units comprising steps of providing one or more first volumes in the one or more first-level storage units, each of the first volumes being a target volume of an access sent from the computer via a fibre channel interface, and the one or more first volumes having at least one virtual volume; establishing a hierarchical relationship between one of the first-level storage units and one of the second-level storage units that allows one or more second volumes in the one of the second-level storage units to be a target volume of an access sent from the computer via a fibre channel interface, wherein the one of the second-level storage units is connected through a fibre channel network to, and hierarchically linked to, one of the first-level storage units, wherein one of the first-level storage units is arranged to receive data access requests from the computer to the virtual volume, and to relay

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the data access requests to at least one of the second volumes based on a relationship between the virtual volume and the at least one second volume that corresponds to the virtual volume, such that the virtual volume as accessed by the computer is transparent as to its relationship one second volume; and displaying the contents of a consolidated information table in at least three display sections of a display, including a third display section for displaying the total available capacity of the first-level and second-level storage units based on subtracting the capacity of the virtual volume from the total capacity of the first and second volumes by using volume information and virtualization information respecting the volumes and storage units.

Independent Claim 24 recites a management computer for managing the status of storage units for containing volumes for storing data used by a computer, comprising a CPU and a fibre channel interface connected by a management unit, wherein the CPU collects volume information on the volumes from one or more first-level storage units containing first volumes, and from one or more second-level storage units, each of which is connected through a fibre channel network to, and hierarchically linked to, one of the first-level storage units. Each of the first volumes is a target volume of an

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access sent from the computer via a fibre channel interface, and the one or more first volumes has at least one virtual volume. The one or more second-level storage units contain at least one second volume, and each of the second volumes can be a target volume of an access sent from the computer via a fibre channel interface. The one or more first-level storage units are arranged to receive data access requests from the computer to the virtual volume, and to relay the data access requests to at least one of the second volumes based on a relationship between the virtual volume and the at least one second volume that corresponds to the virtual volume, such that the virtual volume as accessed by the computer is transparent as to its relationship to the at least one second volume. Further, the CPU calculates the total effective capacity of the volumes of the first-level and the second-level storage units based on subtracting the capacity of the virtual volume from the total capacity of the first and second volumes by using volume information and virtualization information collected by the CPU.

The above summaries of the independent claims highlights some of the patentably-distinctive limitations that are found in the independent claims, but the summaries are not intended to recite exhaustively the only patentable features of the

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claims. The Applicants note that other patentably-distinctive features are present in the claims, and that the combination of limitations of each independent claim lends patentability as well. Further, the dependent claims are considered to have separate patentability over the prior art, whether taken individually or in any motivated combination.

Claim 1 was provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claim 1 of co-pending Application No. 10/811,868. Claim 9 was provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable of Claim 8 of Application '868. The Applicants respectfully traverse the double patenting rejections, noting the substantial amendments made to these Claims 1 and 9, but also noting that the co-pending application claims underlying the provisional rejections contain no recitation of the claimed feature of calculating total effective capacity based on a subtraction as set forth in the claims, wherein the capacity of the virtual volume is subtracted from the total capacity of the first and second volumes so as to reveal the effective capacity of the hierarchical storage subsystem.

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In view of the foregoing amendments and remarks, the Applicants request reconsideration of the rejection and allowance of the claims.

Respectfully submitted,



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